

PREFACE

Several years ago (1969), the National Materials Advisory Board recommended the initiation of an interdisciplinary research effort in nondestructive evaluation. Their recommendation was based upon an assessment of future needs of both the Department of Defense and the nation as a whole. They realized that the cost of reliability was increasing very significantly (and remains in that state today), while at the same time there were inspectability problems in advanced materials systems for which there were no inspection techniques or systems available at any cost. The Air Force Materials Laboratory also recognized the seriousness of this problem and sponsored a Workshop at Dayton to begin a dialogue between the NDE problem generators and the potential problem solvers. A second Workshop was held at the Science Center, Rockwell International, co-sponsored by the National Science Foundation and the Air Force Materials Laboratory (AFML Report TR-73-69). These two Workshops helped serve the important functions of translating inspection problems into research problems and of generating interest in this important field among researchers in academia, industry and Government laboratories. The current Workshop, sponsored by the Advanced Research Projects Agency and the Air Force Materials Laboratory, represents a continuation of this effort. It is both satisfying and rewarding to find that some momentum among research people has been generated in an interdisciplinary way in the important NDE area. This momentum must continue to build on a broadened scientific base if the problems associated with the reliability and quality assurance of the present and future materials systems are to be solved in a cost-effective way.

As a result of conclusions reached and recommendations made by the participants of the previous Workshops, the current program was constructed to further translate inspection problems into research problems and to focus research attention on three key areas that were identified as major problem areas in the earlier Workshops. Accordingly, the Workshop program was divided into four sessions. The first was introductory in nature, while the other three dealt with the subjects of quantitative flaw characterization, strength of bonded materials, and residual stress and related properties. These areas have been recognized as vital problem areas and areas in which the lack of current NDE technology is holding up the utilization of advanced materials and processing techniques. Each session began with a tutorial discussion of the structural materials problem, a description of the physical phenomena involved in the problem, and a review of the state-of-the-art and limitations of the related NDE techniques. These were followed by a number of shorter research papers describing work in progress in various laboratories throughout the country which should have an impact on the problem area. A discussion period followed the presentations in order to provide a forum for communication between the NDE users and researchers and between researchers

in diverse technical disciplines who might otherwise not come together at one place and at one time in an NDE problem-oriented environment. Although no total solutions were presented at the meeting, the Workshop served to generate further research interest in the NDE field and focused the attention of current NDE research activity into significant applications.

The organizers of the Workshop wish to acknowledge the financial support provided by the Advanced Research Projects Agency and the Air Force Materials Laboratory. In addition, they wish to thank all those who participated in the Workshop, both in the presentation of papers and discussion. Acknowledgment is also due the Air Force Office of Scientific Research for their cooperation in formulating the program. Finally, they wish to acknowledge the valuable assistance of the Science Center staff who helped make the Workshop a success, and especially, Mrs. Jo Mills and Mrs. Diane Harris, who arranged all the Workshop details and prepared the final manuscript of its proceedings. In this context, the organizers wish to acknowledge the work of Mr. Charles Voitsberger who transcribed the proceedings.

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